

REMARKS

Request for an Examiner's Interview

The Applicants' Attorney hereby requests an interview with the Examiner in order to expedite the prosecution of this case.

Pending Claims

Claims 1-5, 7-9, 11-21, and 24-32 are pending in the present application. Claims 1 and 24 have been amended. Claims 6 and 22-23 have been previously withdrawn from consideration pursuant to 37 CFR §1.142(b) as being drawn to non-elected groups. The Applicants retain the right to prosecute claims 6 and 22-23 in a divisional application. The Applicants respectfully requests reconsideration of the pending claims in light of the amendments, arguments, and remarks presented in this Amendment and Response for RCE.

Rejection under 35 U.S.C. §112

Claim 10 has been rejected under 35 U.S.C. §112 as failing to comply with the enablement requirement. Claim 10 has been cancelled. Therefore, the Applicants respectfully request that the rejection of dependent claim 10 under 35 U.S.C. §112 be withdrawn.

Rejections under 35 U.S.C. §102

Claims 1-3, 7-8, and 11 are rejected under 35 U.S.C. §102(b) as being anticipated

by U.S. Patent No. 5,567,268 to Kadomura (hereinafter “Kadomura”). To anticipate a claim under 35 U.S.C. §102, a single reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught by the reference must be inherently present in the reference. Thus, a claim is anticipated by a reference only if each and every element of the claim is described, either expressly or inherently, in a single prior art reference.

The Applicants argued in the Amendment and Response filed on October 30, 2006 that Kadomura does not describe a parasitic antenna. The Applicants further argued that Kadomura describes some embodiments that include deactivated antennas that are not electromagnetically coupled to active antennas driven by RF power supplies. The Applicants concluded that the deactivated antennas described in Kadomura are not equivalent to the parasitic antennas claimed in the present application. In response to the Amendment and Response filed on October 30, 2006, the Office Action dated January 25, 2007 states that the word “parasitic” has not been defined in the present specification. In addition, the Office Action states that Examiner believes that the antenna described in Kadomura is a parasitic antenna and will preform the same function as the parasitic antenna described in the present application.

The term parasitic antenna is a very well known term in the art. A parasitic antenna is an antenna that obtains radio frequency energy by induction or radiation from another antenna that is driven by an RF source, which is not electrically connected to the parasitic antenna. Parasitic antennas are very commonly used in radio frequency communications. In fact, most types of directional antennas used for radio frequency

communications include parasitic antenna elements. The present invention is at least, in part, the recognition that parasitic antennas can be used to tune plasmas by parasitic damping via the parasitic antenna.

The term “parasitic antenna” as used in the present invention is an antenna that is in electromagnetic communication with an active antenna, but that is not directly connected to a power supply. In other words, the parasitic antenna claimed in the present application is not directly excited by the power supply, but rather is excited by the active antenna that is driven by the RF source. This definition is supported throughout the specification of the present application. See, for example, paragraph 26 which states that the parasitic coil is not directly coupled to any RF source and that the parasitic coil provides a parasitic effect on the RF coupling that allows tuning of the ionic plasma by parasitically damping.

Independent claim 1 has been amended to recite that the plasma is tuned by parasitic damping via the parasitic antenna. The Applicants submit that Kadomura does not teach a plasma apparatus that includes a parasitic antenna wherein the plasma is tuned by parasitic damping via the parasitic antenna for the reasons stated in the following paragraphs.

The Office Action states that the antenna described in Kadomura is a parasitic antenna. The Applicants respectfully submit that this statement is incorrect. Kadomura does not describe, either expressly or inherently, a parasitic antenna. Instead, Kadomura describes a plasma processing apparatus that is designed to operate with either two active

antennas or with one active antenna and one de-energized (inactive) antenna. In operating modes where the Kadomura plasma processing apparatus operates with one active antenna and with one de-energized (inactive) antenna, the de-energized antenna is not excited by the active antenna that is driven by the RF source.

Kadomura FIG. 2 illustrates an apparatus where both a helicon wave plasma and an inductively coupled plasma are excited in a dry etching apparatus. The helicon wave plasma is generated in the top area of the process chamber and the inductively coupled plasma is generated downstream. Kadomura FIG. 3 illustrates an apparatus configured to produce only the helicon wave plasma in the top area of the process chamber by energizing only one coil (i.e. by switching switch 35 on and switching switch 38 off). The Applicants submit that the de-energized coil in this embodiment is not a parasitic coil. Furthermore, the Applicants submit that there is no description in Kadomura of tuning the plasma by parasitic damping via a parasitic antenna as claimed in independent claim 1 as currently amended.

Thus, the Applicants submit that independent claim 1 is not anticipated by Kadomura because Kadomura does not describe, either expressly or inherently, the claimed plasma immersion ion implantation apparatus that includes a parasitic antenna. Therefore, the Applicants submit that independent claim 1 is allowable and that dependent claims 2-5 and 7-9, and 11-21 are allowable as depending from an allowable base claim.

If the present rejection under 35 U.S.C. §102 is maintained, the Applicants

respectfully request that the Examiner specifically state why she believes that the de-energized coils 31 or 32 shown in Kadomura FIGS. 2 and 3 are parasitic coils that tune the plasma by parasitic damping as claimed in independent claim 1 as currently amended.

Rejections under 35 U.S.C. §103(a)

Claims 4, 5, 9, 12-21, 24-25, and 27-32 have been rejected under 35 U.S.C. §103(a). Claim 4 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of U.S. Patent No. 6,465,051 to Sahin et al. (hereinafter “Sahin”). Claim 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of Sahin and further in view of U.S. Patent No. 5,888,413 to Okumura et al. (hereinafter “Okumura”). Claim 9 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of U.S. Patent No. 5,681,418 to Ishimaru (hereinafter “Ishimaru”). Claims 12-13 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of U.S. Patent No. 5,556,501 to Collins et al. (hereinafter “Collins”). Claim 14 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of Collins and further in view of U.S. Patent No. 6,626,188 to Fitzsimmons et al. (hereinafter “Fitzsimmons”). Claim 16 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of Collins and further in view of U.S. Patent No. 5,824,607 to Trow et al. (hereinafter “Trow”). Claim 17 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of U.S. Patent No. 5,916,455 to Kumagai (hereinafter “Kumagai”). Claim 18 was rejected under 35 U.S.C. §103(a) as being unpatentable

over Kadomura in view of Collins. Claims 19-21 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of Collins.

Claims 24-25, 27 and 31 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of Collins and Trow. Claim 32 was rejected under 35 U.S.C. §103(a) as being unpatentable over Collins in view of Trow and further in view of Kumagai.

Claim 28 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of Collins, Trow, and Sahin. Claim 29 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of Collins, Trow, Sahin, and Okumura. Claim 30 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of Collins, Trow, and Ishimaru. Claim 32 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura in view of Collins, Trow, and Kumagai.

To be unpatentable under 35 U.S.C. §103(a), the differences between the subject matter sought to be patented and the prior art must be such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art. There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the reference teachings.

As described in connection with the rejection of independent claim 1 under 35 U.S.C §102 the Applicants submit that dependent claims 4, 5, 9, and 12-21 are allowable as depending from an allowable base claim.

Independent claim 24 has been amended to recite a plasma chamber including a radio frequency antenna including a horizontally-extending coil and a vertically-extending coil, wherein one of the horizontally-extending coil and the vertically-extending coil comprises a parasitic antenna. Independent claim 24 has also been amended to recite that the plasma is tuned by parasitic damping via the parasitic antenna.

As stated in connection with the rejection under 35 U.S.C. §102(b), Kadomura does not describe, either expressly or inherently, the plasma immersion ion implantation apparatus including the parasitic antenna that is claimed in independent claim 24 as currently amended. In addition, Kadomura does not describe, either expressly or inherently, tuning the plasma by parasitic damping via the parasitic antenna that is claimed in independent claim 24 as currently amended. In addition, the Applicants submit that the prior art of record including Kadomura, Sahin, Okumura, Ishimaru, Collins, Fitzsimmons, Trow, and Kumagai do not teach or suggest all the claim limitations in independent claim 24. Therefore, the Applicants submit that independent claim 24 is allowable and that dependent claims 25 and 27-32 are allowable as depending from an allowable base claim.

CONCLUSION

Claims 1-5, 7-9, 11-21, and 24-32 are pending in the present application. Claims 1 and 24 have been amended and claim 10 has been cancelled. The Applicants respectfully requests reconsideration of the pending claims in light of the amendments, remarks, and arguments presented in this Amendment and Response.

If, in the Examiner's opinion, a telephonic interview would expedite prosecution of the present application, the undersigned attorney would welcome the opportunity to discuss any outstanding issues, and to work with the Examiner toward placing the application in condition for allowance.

Respectfully submitted,

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